HOME

UOR
Data Documentation

Introduction

During the two Arabesque cruises, nearly 50 tows were completed using the Undulating Oceanographic Recorder (UOR). This document describes the UOR data from both cruises : Discovery cruise 210, August - September 1994 and Discovery cruise 212, October - November 1994. It includes measurements made from the standard CTD unit (salinity derived from conductivity, temperature and depth) and from an additional fluorometer attached to the UOR. This document details the protocols used during data acquisition and processing.

N.B. Please note that all times given are in GMT which is local ship time minus four hours.

Where's the Data ?

The data files can be found in the UOR directory. There are two subdirectories - DI210 and DI212 - which relate to the cruises on which the measurements were made. Each file, UORnn.txt refers to a single UOR deployment or tow, where nn is the tow number.

The files are ASCII text files and each have a 30 line header which gives general details on the size of the file and the number of data channels it contains. The data listings then follow. Note that each data cycle has an associated quality control character flag, which may take any of the following values:

- G good data
- S suspect or bad data
- I interpolated data
- N null data (not measured)

Further details on how these flags were assigned is given below.

Instrumentation and Deployment Details

The 49 tows, encompassing several hundred profiles were taken using the Plymouth Marine Laboratory UOR incorporating a Chelsea Instruments CTD (pressure sensor, conductivity cell, platinum resistance thermometer) and a purpose-built fluorometer which is described in Aiken (1981). A SeaTech 25cm pathlength transmissometer, tilt and roll sensors and an array of upwelling and downwelling radiance and irradiance sensors were also included, although that data is not available here.

The UOR was towed approximately 350 metres behind the ship at speeds up to twelve knots. The undulating window was set between 2 and 92 metres with the vehicle undulating approximately every 6 minutes (2 kilometres).

Further details of the UOR are given in Aiken (1985).

Data Acquisition

The UOR sampled at an interval of 4 seconds. This gave a maximum towing time of about fifteen hours as data were recorded in the body of the instrument in an onboard solid-state data logger and then dumped to computer after retrieval of the vehicle.

On-Board Data Processing

Following each tow, the logger memory card was removed from the UOR, exchanged for a blanked memory card and the logger reset for the next operation. Data was downloaded from the memory card to a PC, where customised software was used to apply calibration coefficients and convert the raw counts into engineering units (Volts for the transmissometer and fluorometer, $mmho.cm^{-1}$ for conductivity and °C for temperature). The calibration coefficients were determined as follows :

- Pressure : pre-cruise calibration using a cylinder of pressurized air.
- Temperature : pre-cruise calibrations in a water bath, against standard thermometers.
- Salinity : nominal calibration
- Chlorophyll : nominal calibration

Salinity (Practical Salinity Units, as defined by the Practical Salinity Scale (Fofonoff and Millard 1982)) was calculated from the conductivity ratios (conductivity / 42.914) and a time lagged temperature.

Post-Cruise Processing

Re-calibration

This was done at PML by comparison with the calibrated CTD data. Details of the protocols used for calibrating the CTDs are given in the CTD document.

- Pressure : this was compared with the CTD data, matching up the times when the bottles were fired. Precision is expected to be within 0.2 metres.
- Temperature : adjusted to bring it into line with the CTD data, although this is less accurate than the CTD data, as it has a target precision of 0.05 °C.
- Salinity : adjusted to bring it into line with the CTD data, although this is less accurate than the CTD data, as it has a target precision of 0.05 PSU.
- Chlorophyll : calibrated against discrete samples taken from 654 shallow (<300 metres) CTD bottles. Samples were filtered through Whatman GF/F filters and frozen in liquid nitrogen until analysed on board. The frozen filters were extracted in 2-5 ml of 90% acetone and aliquot injected onto a C-8 reverse phase column. **Analysis was carried out by reverse phase HPLC**. The resultant concentrations of chlorophyll and diavinyl chlorophyll a were summed to give a total calibration concentration.

Data were then submitted to BODC for screening and data-banking

Reformatting

The data were converted into the BODC internal format (PXF) to allow the use of in-house software tools, notably the workstation graphics editor. The Transfer program also extracted position data (latitude and longitude) from the binary merge file and merged it with the UOR data. As the UOR data were sampled at a frequency of 4 seconds, whereas the position information was only available at 1 minute intervals, linear interpolation was used to provide a position for each datacycle.

Editing

Using a custom in-house graphics editor, the downcasts and upcasts were differentiated and the limits of the downcasts were manually flagged. Spikes on any of the downcast or upcast channels were manually flagged 'suspect' by modification of the associated quality control flag. An instrument spike was defined as a single value or small number of values which showed an inexplicable variation of more than the recommended target precision for that particular parameter. “Flagging” involved setting a single character quality control flag to denote the status of the data; in this way none of the original data values were edited or deleted during quality control. The following quality control flags were used :

- G good data
- S suspect data (instrument spike or malfunction)
- N null data (not measured)

Once screened, the CTD downcasts were loaded into a database under the Oracle relational database management system.

Data Warnings

Chlorophyll : Due to a sensitivity problem with the fluorometer on both cruises, spurious concentrations were occasionally observed, particularly where the UOR began to dive, or where a thermocline was crossed. Any improbably high concentrations or negative values have been flagged suspect.

Salinity : The difference in response time between the temperature and conductivity sensors often gave rise to spurious salinities when the UOR crossed a thermocline. These have been flagged suspect.

Bibliography

Aiken J. 1981 A chlorophyll sensor for automatic remote operation in the marine environment. ***Marine Ecology Progress Series*** 4 : 235-239.

Aiken J. 1985. The Undulating Oceanographic Recorder Mark 2. A multirole oceanographic sensor for mapping and modelling the biophysical marine environment. In : Mapping Strategies in Chemical Oceanography. ed A. Zirino ***American Chemical Society*** 209 : 315-332

Fofonoff N.P. and Millard R.C. 1982. Algorithms for computation of fundamental properties of seawater. ***UNESCO Technical Papers in Marine Science.*** 44.